Reference Only

CHIP COMMON MODE CHOKE COIL for Consumer equipment & Industrial equipment DLW21SN□□□XK2□ REFERENCE SPECIFICATION

1. Scope

This reference specification applies to Chip Common Mode Choke Coil DLW21SN_XK Series.

1.1 Specific applications:

- Power equipment: Products that can be used in power equipment such as renewable energy equipment, energy storage equipment and EV charging equipment and whose functions are not directly related to the protection of human life and property.
- Industrial equipment: Products that can be used in industrial equipment such as base stations, manufacturing equipment, industrial robotics equipment, and measurement equipment, and whose functions do not directly relate to the protection of human life and property.
- Medical equipment (GHTF Class C) *Except for implant/surgery/auto injector: Products that can be used for medical equipment of Class C of the international classification class GHTF and whose malfunction is considered to pose a relatively high risk to the human body.
- Medical equipment (GHTF Class A and B): Products that can be used for medical equipment regulated by Class A and Class B of the international classification class GHTF and whose functions do not directly relate to the protection of human life and property.
- Consumer equipment: Products that can be used in consumer equipment such as home appliances, audio/visual equipment, communication equipment, information equipment, office equipment, and household robotics, and whose functions are not directly related to the protection of human life and property.

1.2 Unsuitable application:

Applications listed in “Limitation of applications” in this reference specification.
WE DISCLAIM ANY LOSS AND DAMAGES ARISING FROM OR IN CONNECTION WITH THE PRODUCTS INCLUDING BUT NOT LIMITED TO THE CASE SUCH LOSS AND DAMAGES CAUSED BY THE UNEXPECTED ACCIDENT, IN EVENT THAT THE PRODUCT IS APPLIED FOR THE PURPOSE WHICH IS SPECIFIED ABOVE AS THE UNSUITABLE APPLICATION FOR THE PRODUCT.

2. Part Numbering

(ex)	DL	W	21	S	N	221	X	K	2	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

(1) Chip Common Mode Choke Coil
(2) Structure (W : Winding Type)
(3) Dimension (L×W)
(4) Type
(5) Category
(6) Impedance (Typ. at 100MHz)
(7) Circuit
(8) Features
(9) Number of Line
(10) Packaging Code L : Taping / B : Bulk

3. Rating

Customer Part Number	Murata Part Number	Common Mode Impedance (at 100MHz,Under Standard Testing Condition) (Ω)	Rated Voltage V(DC)	Withstanding Voltage V(DC)	Rated Current (mA)	DC Resistance (Ω max.)	Insulation Resistance (MΩ min.)
	DLW21SN211XK2L	210 ± 25%	20	50	360	0.33	10
	DLW21SN211XK2B						

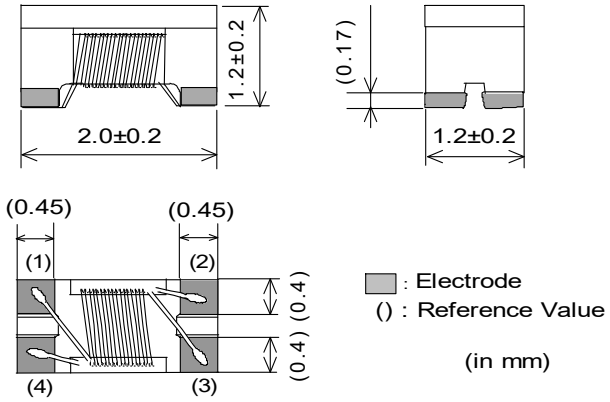
Operating Temperature : -40 to +85°C Storage Temperature : -40 to +85°C

4. Standard Testing Condition

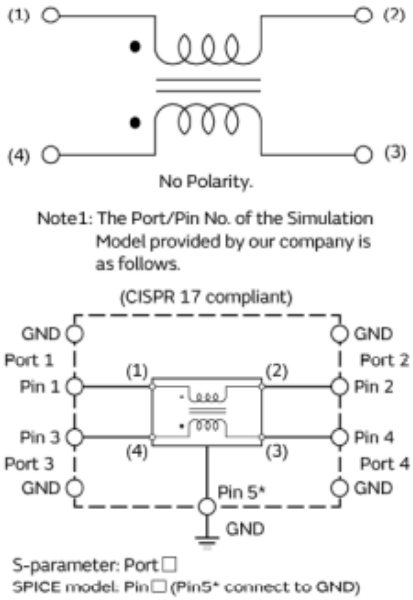
<Unless otherwise specified>
Temperature : Ordinary Temperature 15 to 35°C
Humidity : Ordinary Humidity 25 to 85%(RH)

<In case of doubt>
Temperature : 20 ± 2°C
Humidity : 60 to 70%(RH)
Atmospheric Pressure : 86 to106kPa

5. Style and Dimensions



■ Equivalent Circuit (Note 1)



■ Unit Mass (Typical value)

0.011g

6. Marking

No Marking.

7. Electrical Performance

No.	Item	Specification	Test Method
7.1	Common Mode Impedance (Zc)	Meet item 3.	Measuring Equipment : KEYSIGHT 4291A or the equivalent Measuring Frequency : 100±1MHz (ref.item 10,11)
7.2	Withstanding Voltage	Products shall not be damaged.	Test Voltage : 2.5 times for Rated Voltage Time : 1 to 5 s Charge Current : 1 mA max. (ref.item 10)
7.3	DC Resistance (Rdc)	Meet item 3.	Measuring current : 100mA max. (ref.item 10) (In case of doubt in the above mentioned standard condition, measure by 4 terminal method.)
7.4	Insulation Resistance (I.R.)		Measuring voltage : Rated Voltage Measuring time : 1 min max. (ref.item 10)

8. Mechanical Performance

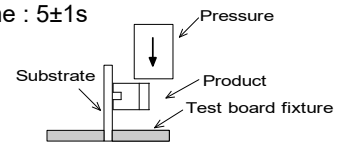
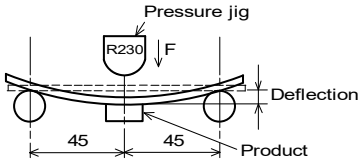
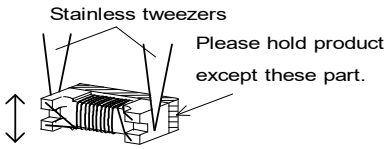
<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>8.1</td><td>Appearance and Dimensions</td><td>Meet item 5.</td><td>Visual Inspection and measured with Slide Calipers.</td></tr>
<tr><td>8.2</td><td>Bonding Strength</td><td>No evidence of coming off substrate.
Products shall not be mechanical damaged.</td><td>It shall be soldered on the substrate.
Applying Force(F) : 5N
Applying Time : 5±1s
</td></tr>
<tr><td>8.3</td><td>Bending Strength</td><td>Meet Table 1.

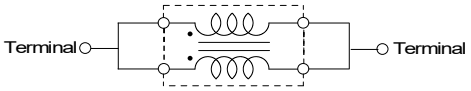
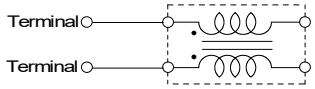
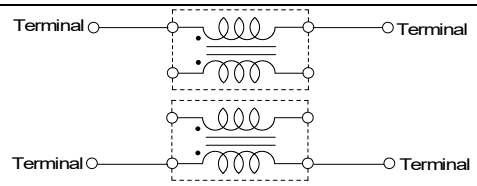
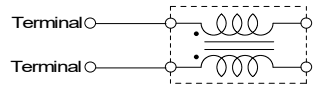
Table 1
<table><tr><td>Appearance</td><td>No damaged</td></tr><tr><td>Common Mode Impedance Change</td><td>within ±20%</td></tr><tr><td>I.R.</td><td>10MΩ min.</td></tr><tr><td>Withstanding Voltage</td><td>No damaged</td></tr></table></td><td>It shall be soldered on the Glass-epoxy substrate.
Deflection : 2mm (t=1.0mm)
Keeping time : 5 s
Speed of Applying Force : 0.5mm/s
</td></tr>
<tr><td>8.4</td><td>Drop</td><td></td><td>It shall be dropped on concrete or steel board.
Method : free fall
Height : 1 m
The Number of Times : 3 times</td></tr>
<tr><td>8.5</td><td>Vibration</td><td></td><td>It shall be soldered on the substrate.
Oscillation Frequency : 10 to 55 to 10Hz for 1 min
Total Amplitude : 1.5mm
Testing Time : A period of 2 hours in each of 3 mutually perpendicular directions. (Total 6 hours)</td></tr>
<tr><td>8.6</td><td>Solderability</td><td>The electrodes shall be at least 90% covered with new solder coating.</td><td>Flux:Ethanol solution of rosin,25(wt)% includes activator equivalent to 0.06 to 0.10(wt)% chlorine
Pre-Heating : 80 to 120°C 1min
Solder : Sn-3.0Ag-0.5Cu
Solder Temperature : 245±3°C
Immersion Time : 4±1 s
Immersion and emersion rates : 25mm/s
</td></tr>
<tr><td>8.7</td><td>Resistance to Soldering Heat</td><td>Meet Table 1.</td><td>Flux : Ethanol solution of rosin,25(wt)% includes activator equipment to 0.06 to 0.10(wt)% chlorine
Pre-Heating : 80 to 120°C, 1min
Solder : Sn-3.0Ag-0.5Cu
Solder Temperature : 260±5°C
Immersion Time : 5±0.5 s
Immersion and emersion rates : 25mm/s
Then measured after exposure in the room condition for 4 to 48 hours.</td></tr>
</table>

9. Environmental Performance(Products shall be soldered on the substrate.)

No.	Item	Specification	Test Method
9.1	Temperature Cycle	Meet Table 1.	1 Cycle Step 1 -40°C(+0°C,-3°C) / 30±3 min Step 2 Ordinary Temp. / 10 to 15 min Step 3 +85°C(+3°C,-0°C) / 30±3 min Step 4 Ordinary Temp. / 10 to 15 min Total of 100 cycles Then measured after exposure in the room condition for 4 to 48 hours
9.2	Humidity		Temperature : 40±2°C Humidity : 90~95%(RH) Time : 1000(+48 hours,-0 hours) Then measured after exposure in the room condition for 4 to 48 hours.
9.3	Heat life		Temperature : 85±2°C Applying Voltage : 2times for Rated Voltage Time : 1000(+48 hours,-0 hours) Then measured after exposure in the room condition for 4 to 48 hours. (ref.item 10)
9.4	Cold Resistance		Temperature : -40± 2°C Time : 1000(+48 hours,-0 hours) Then measured after exposure in the room condition for 4 to 48 hours.

10. Terminal to be Tested.

When measuring and supplying the voltage, the following terminal is applied.

No.	Item	Terminal to be Tested
10.1	Common Mode Impedance (Measurement Terminal)	
10.2	Withstanding Voltage (Measurement Terminal)	
10.3	DC Resistance (Measurement Terminal)	
10.4	Insulation Resistance (Measurement Terminal)	
10.5	Heat Life(Supply Terminal)	

11. Measuring method for common mode impedance.

Measured common mode impedance may be included measurement error due to stray capacitance, residual inductance of test fixture.

To correct this error, the common mode impedance should be calculate as follows;

(1) Measure admittance of the fixture(opened), Go Bo.

(2) Measure impedance of the fixture(shorted), Rs Xs.

(3) Measure admittance of the specimen, Gm Bm.

(4) Calculate corrected impedance $|Z|$ using the formula below.

$$|Z| = (Rx^2+Xx^2)^{1/2}$$

Where

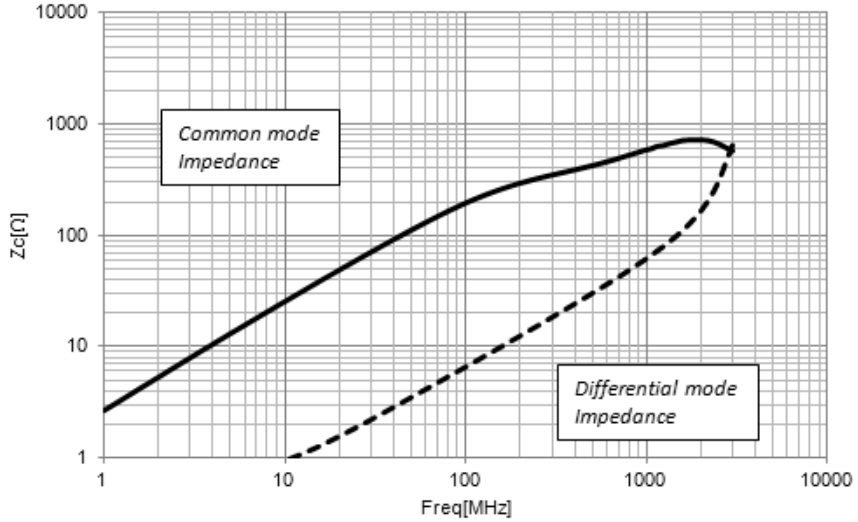
$$Rx = \frac{Gm-Go}{(Gm-Go)^2 + (Bm-Bo)^2} - Rs$$

$$Xx = \frac{-(Bm- Bo)}{(Gm-Go)^2 + (Bm-Bo)^2} - Xs$$

12. P.C.B., Flux, Solder and Soldering condition

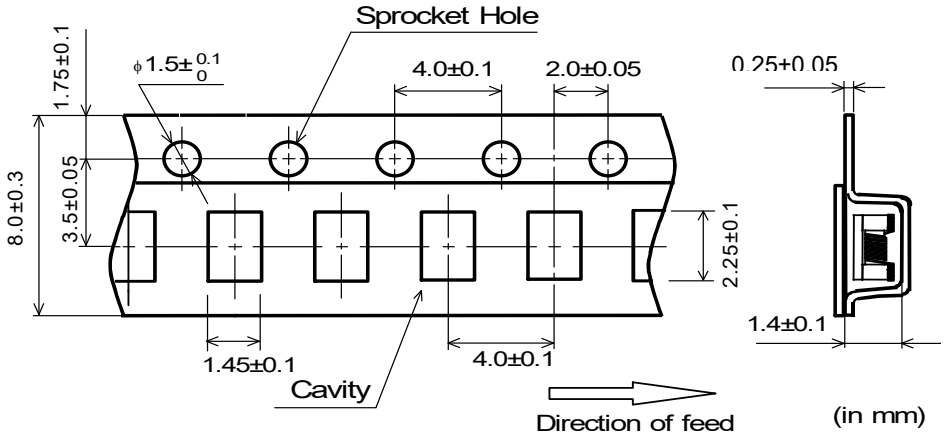
Test shall be done using P.C.B., Flux, Solder and Soldering condition which are specified in item 16 except the case of being specified special condition.

13. Impedance Frequency Characteristics (Typical)



14. Specification of Packaging

14.1 Appearance and Dimensions (8mm-wide,Plastic tape)



*Dimension of the Cavity is measured at the bottom side.

14.2 Specification of Taping

(1)Packing quantity(Standard quantity) 2000 pcs. / reel

(2)Packing Method

Products shall be packaged in each embossed cavity of plastic tape and sealed with cover tape.

(3) Spliced point

The cover tape have no spliced point.

(4) Sprocket Hole

The sprocket holes are to the right as the tape is pulled toward the user.

(5)Missing components number

Missing components number within 0.025% of the number per reel or 1 pc., whichever is greater, and are not continuous. The specified quantity per reel is kept.

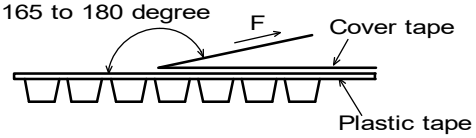
14.3 Pull Strength of Plastic Tape

Plastic Tape	5N min.
Cover Tape	10N min.

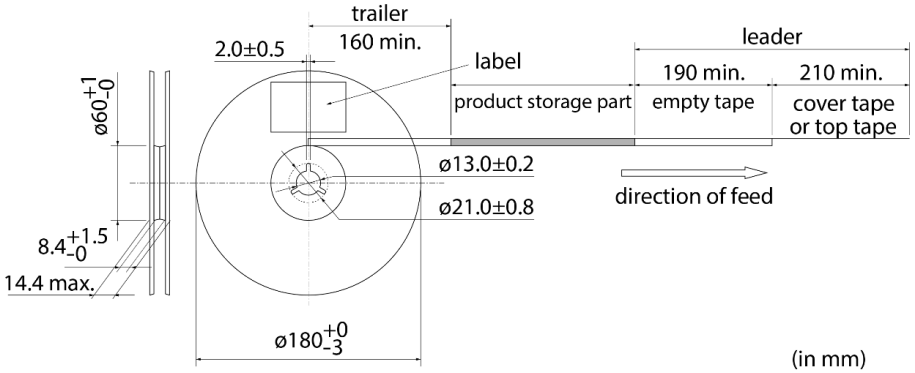
14.4 Peeling off force of Cover Tape

0.2 to 0.7N(Minimum value is Typical)

Speed of Peeling off : 300 mm / min



14.5 Dimensions of Leader-tape, Trailer and Reel



14.6 Marking for reel

Customer part number, MURATA part number, Inspection number(∗1), RoHS discrimination(∗2), Quantity, etc

∗1) « Expression of Inspection No. » □□ (1) OOOO (2) ××× (3)

(1) Factory Code
(2) Date First digit : Year / Last digit of year
Second digit : Month / Jan. to Sep. → 1 to 9, Oct. to Dec. → O,N,D
Third, Fourth digit : Day
(3) Serial No.

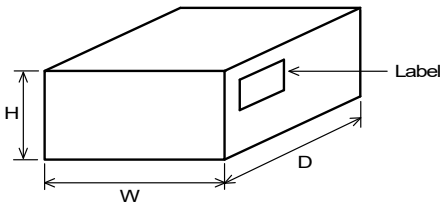
∗2) « Expression of RoHS discrimination » ROHS – Y (△) (1) (2)

(1) RoHS regulation conformity parts.
(2) MURATA classification number

14.7 Marking for Outside package

Customer name Purchasing Order Number, Customer Part Number, MURATA part number, RoHS discrimination(∗2), Quantity, etc

14.8 Specification of Outer Case



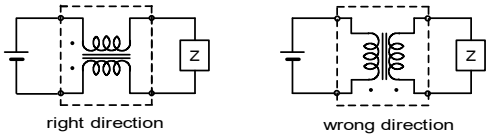
Outer Case Dimensions (mm)			Standard Reel Quantity in Outer Case (Reel)
W	D	H	
186	186	93	5

∗ Above Outer Case size is typical. It depends on a quantity of an order.

15. ⚠Caution

15.1 Mounting Direction

Mount products in right direction.
Wrong direction which is 90° rotated from right direction causes not only open or short circuit but also flames or other serious trouble.



15.2 Limitation of Applications

The products listed in the reference specification (hereinafter the product(s) is called as the “Product(s)”) are designed and manufactured for applications specified in the reference specification (hereinafter called as the “Specific Application”).

We shall not warrant anything in connection with the Products including fitness, performance, adequateness, safety, or quality, in the case of applications listed in from (1) to (11) written at the end of this precautions, which may generally require high performance, function, quality, management of production or safety. Therefore, the Product shall be applied in compliance with the specific application.

WE DISCLAIM ANY LOSS AND DAMAGES ARISING FROM OR IN CONNECTION WITH THE PRODUCTS INCLUDING BUT NOT LIMITED TO THE CASE SUCH LOSS AND DAMAGES CAUSED BY THE UNEXPECTED ACCIDENT, IN EVENT THAT (i) THE PRODUCT IS APPLIED FOR THE PURPOSE WHICH IS NOT SPECIFIED AS THE SPECIFIC APPLICATION FOR THE PRODUCT, AND/OR (ii) THE PRODUCT IS APPLIED FOR ANY FOLLOWING APPLICATION PURPOSES FROM (1) TO (11) (EXCEPT THAT SUCH APPLICATION PURPOSE IS UNAMBIGUOUSLY SPECIFIED AS SPECIFIC APPLICATION FOR THE PRODUCT IN OUR CATALOG SPECIFICATION FORMS, DATASHEETS, OR OTHER DOCUMENTS OFFICIALLY ISSUED BY US*).

(1) Aircraft equipment
(2) Aerospace equipment
(3) Undersea equipment
(4) Power plant control equipment
(5) Medical equipment
(6) Transportation equipment
(7) Traffic control equipment
(8) Disaster prevention/security equipment
(9) Industrial data-processing equipment
(10) Combustion/explosion control equipment
(11) Equipment with complexity and/or required reliability equivalent to the applications listed in the above.

For exploring information of the Products which will be compatible with the particular purpose other than those specified in the reference specification, please contact our sales offices, distribution agents, or trading companies with which you make a deal, or via our web contact form.

Contact form: https://www.murata.com/contactform

* We may design and manufacture particular Products for applications listed in (1) to (11). Provided that, in such case we shall unambiguously specify such Specific Application in the reference specification without any exception. Therefore, any other documents and/or performances, whether exist or non-exist, shall not be deemed as the evidence to imply that we accept the applications listed in (1) to (11).

15.3 Corrosive gas

Please refrain from use since contact with environments with corrosive gases (sulfur gas [hydrogen sulfide, sulfur dioxide, etc.], chlorine, ammonia, etc.) or oils (cutting oil, silicone oil, etc.) that have come into contact with the previously stated corrosive gas environment will result in deterioration of product quality or an open from deterioration due to corrosion of product electrode, etc. We will not bear any responsibility for use under these environments.

16. Notice

Products can only be soldered with reflow.

This product is designed for solder mounting.

Please consult us in advance for applying other mounting method such as conductive adhesive.

16.1 Flux and Solder

Flux	Use rosin-based flux,(with converting chlorine content 0.06 to 0.1(wt)%.), but not highly acidic flux (with Halogen content exceeding 0.2(wt)% conversion to chlorine). Do not use water-soluble flux.
Solder	Use Sn-3.0Ag-0.5Cu solder

16.2 Assembling

<Exclusive use of Reflow soldering>

Flow soldering may cause deterioration in insulation resistance.

So, reflow soldering shall be applied for this product.

16.3 Cleaning Conditions

Do not clean after soldering. Some cleaning agents may degrade bonding strength,and characteristics of products by detaching. If cleaning,please contact us.

16.4 Resin coating

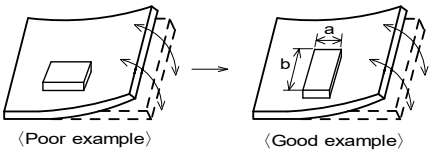
The impedance value may change due to high cure-stress of resin to be used for coating/molding products. An open circuit issue may occur by mechanical stress caused by the resin, amount/cured shape of resin, or operating condition etc. Some resin contains some impurities or chloride possible to generate chlorine by hydrolysis under some operating condition may cause corrosion of wire of coil, leading to open circuit. So, please pay your careful attention when you select resin in case of coating/molding the products with the resin. Prior to use the coating resin, please make sure no reliability issue is observed by evaluating products mounted on your board.

16.5 Attention regarding P.C.B. bending

The following shall be considered when designing and laying out P.C.B.'s.

(1) P.C.B. shall be designed so that products are not subject to the mechanical stress due to warping the board.

［Products direction］

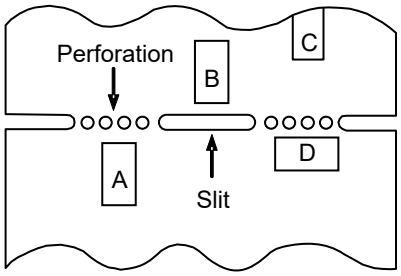


Products shall be location the sideways Direction (Length : a<b) to the mechanical Stress.

(2)Components location on P.C.B. separation.

It is effective to implement the following measures, to reduce stress in separating the board.
It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

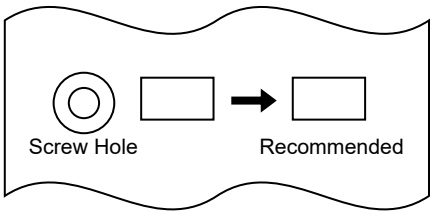
Contents of Measures	Stress Level
(1) Turn the mounting direction of the component parallel to the board separation surface.	A > D *1
(2) Add slits in the board separation part.	A > B
(3) Keep the mounting position of the component away from the board separation surface.	A > C



*1 A > D is valid when stress is added vertically to the perforation as with Hand Separation.
If a Cutting Disc is used, stress will be diagonal to the PCB, therefore A > D is invalid.

(3) Mounting Components Near Screw Holes

When a component is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw. Mount the component in a position as far away from the screw holes as possible.



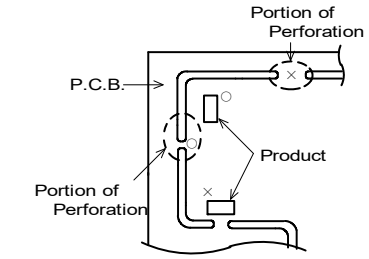
16.6 Attention Regarding P.C.B. Design

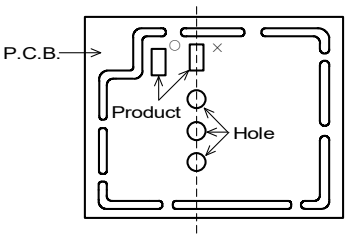
< The Arrangement of Products >

P.C.B. shall be designed so that products are far from the portion of perforation.

The portion of perforation shall be designed as narrow as possible, and shall be designed so as not to be applied the stress in the case of P.C.B. separation.

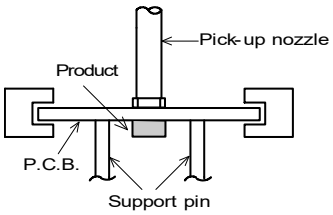
Products shall not be arranged on the line of a series of holes when there are big holes in P.C.B.
(Because the stress concentrate on the line of holes.)





< Products Placing >

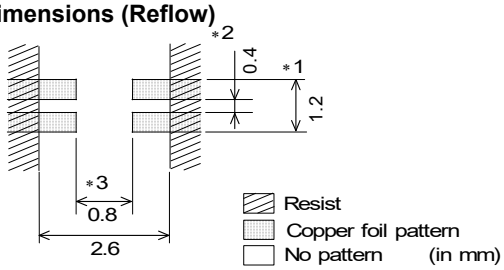
Support pins shall be set under P.C.B . to prevent causing a warp to P.C.B. during placing the products on the other side of P.C.B.



< P.C.B. Separation >

P.C.B. shall not be separated with hand.
P.C.B. shall be separated with the fixture so as not to cause P.C.B. bending.

16.7 Standard Land Dimensions (Reflow)



*1 If the pattern is made with wider than 1.2mm. It will result to let component turn around, because melting speed is different. In the worst case, short circuit between lines may be occured.

*2 If the pattern is made with less than 0.4mm , in the worst case , short circuit between lines may be occurred due to the spread of soldering paste or mount placing accuracy.

*3 If the pattern is made with wider than 0.8mm, the strength of bending will be reduced.

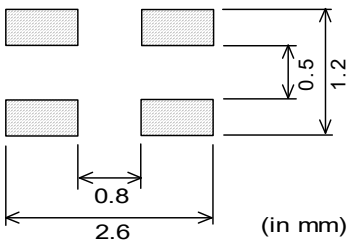
*4 Do not use gilded pattern. A copper wire may cause open by dissolution of metallization.

16.8 Standard Soldering Condition

1.Reflow Soldering

(1)Standard printing pattern of solder paste

- Standard thickness of the solder paste should be 100 to 150μm.
- Use the solder paste printing pattern of the right pattern.
- For the resist and copper foil pattern, use standard land dimensions.
- Use the Solder Sn-3.0Ag-0.5Cu for pattern printing.
- Spread of soldering paste between lines may cause short circuit of lines.

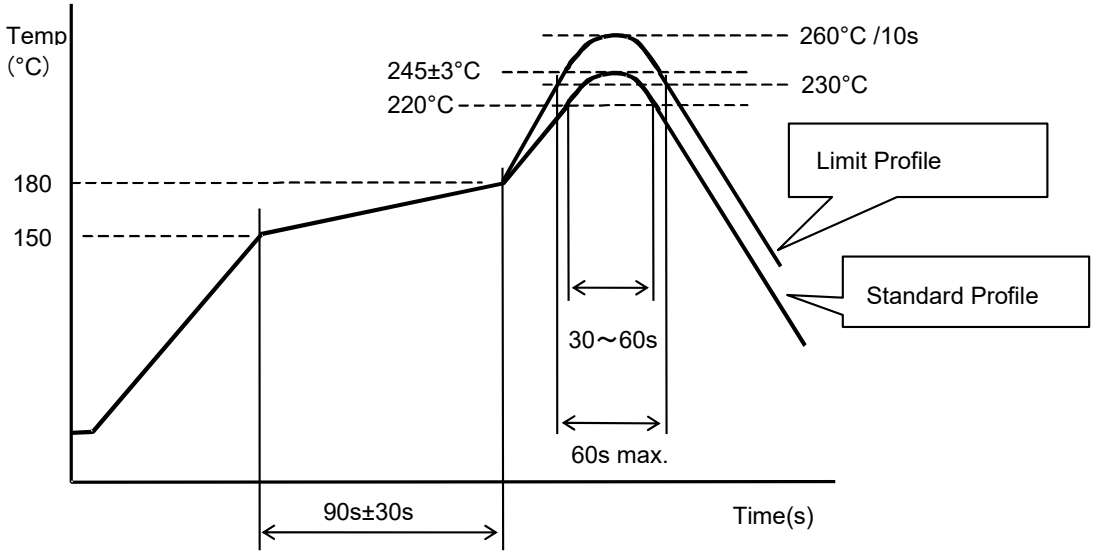


(2) Soldering Temperature

Temperature difference between soldering and surface of components must be within 150°C, in preheating. When components are immersed in liquid after soldering, temperature difference should be within 100°C. If preheating is not enough, components may be cracked and cause deterioration in insulation resistance.

(3) Soldering Condition

Standard soldering profile and the limit soldering profile is as follows.
The excessive limit soldering conditions may cause leaching of the electrode and / or resulting in the deterioration of product quality.



	Standard Profile	Limit Profile
Pre-heating	150～180°C 、90s±30s	
Heating	above 220°C、30s～60s	above 230°C、60s max.
Peak temperature	245±3°C	260°C、10s
Cycle of reflow	2 times	2 times

2. Reworking with Soldering iron

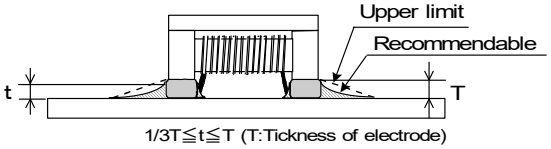
The following conditions must be strictly followed when using a soldering iron after being mounted by reflow soldering.

- Pre-heating: 150°C, 1 min
- Soldering iron output: 30W max.
- Tip temperature: 350°C max.
- Tip diameter:φ3mm max.
- Soldering time : 3(+1,-0) s.
- Times : 2times max.

Notes : Do not touch the products directly with the soldering iron.
Do not remove the product from P.C.B.. If the removed product is re-soldered on P.C.B. ,characteristic impedance may change.

3. Solder Volume

Solder shall be used not to be exceed the upper limits as shown below.

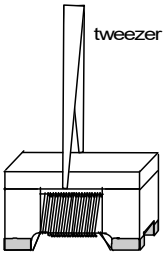


Accordingly increasing the solder volume, the mechanical stress to Chip is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance.

16.9 Caution for use

・When you hold products with a tweezer, please hold like a figure of the right side, and sharp material, such as a pair of tweezers, shall not be touched to the winding portion to prevent the breaking of wire.

・Mechanical shock should not be applied to the products mounted on the board to prevent the breaking of the core.

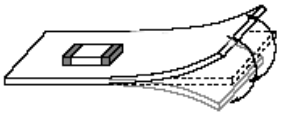


16.10 Handling of a substrate

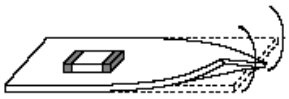
After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate.

Excessive mechanical stress may cause cracking in the product.

Bending



Twisting



16.11 Brushing of neighborhood of products

When you clean the neighborhood of products such as connector pins, bristles of cleaning brush shall not be touched to the winding portion to prevent the breaking of wire.

16.12 Operating Environment

Do not use this product under the following environmental conditions, on deterioration of the performance, such as insulation resistance may result from the use.

(1) in corrosive gases (acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc.)

(2) in the atmosphere where liquid such as organic solvent, may splash on the products.

16.13 Storage Condition

(1) Storage period

Use the products within 12 months after delivered.

Solderability should be checked if this period is exceeded.

(2) Storage environment conditions

・Products should be stored in the warehouse on the following conditions.

Temperature : -10 ~ +40°C

Humidity : 15 to 85% relative humidity No rapid change on temperature and humidity.

・ Products should not be stored in corrosive gases, such as sulfureous, acid gases, alkaline gases, to prevent the following deterioration.

Poor solderability due to the oxidized electrode.

・ Products should be stored on the palette for the prevention of the influence from humidity,dust and so on.

・ Products should be stored in the warehouse without heat shock, vibration, direct sunlight and so on.

・ Avoid storing the product by itself bare (i.e.exposed directly to air).

(3) Delivery

Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

17. ⚠Note

(1)Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

(2)You are requested not to use our product deviating from the reference specifications.

(3)The contents of this reference specification are subject to change without advance notice. Please approve our product specifications or transact the approval sheet for product specifications before ordering.